Small mammal capture rates in dormant vs. growing season prescribed burn areas and their bait preference at Cooper Farm in Muncie, Indiana

An Honors Thesis (HONR 499)

by

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Abstract

Prescribed burning is an important tool for maintaining prairies, and it is used with the tall grass prairies on Cooper Farm. There are two categories of this prescribed burning: dormant season burning occurs in late fall or early spring while growing season burning occurs in the late summer. Both types of burning accomplish the same task of reducing the area of woody growth and helping to renew and encourage the further development of nutrients in the area. Small mammals can be indicative of the environment's health, In this study, small mammals were trapped in plots on Cooper Farm where half had been burned during the dormant season and the other half burned during the growing season in order to determine the success of these burning strategies. Trapping occurred from September 28th to November 4th of 2015 in a total of 11 trapping sessions. Each trapping session consisted of three days during which two prairie plots were set up with fifty Sherman traps placed in a grid pattern in two prairie plots. In addition to these two grids, a transect of 24 Sherman traps was placed in a third prairie plot for each trapping session. In this transect, 12 pairs of traps were strategically placed where one of each pair contained a peanut butter and oatmeal mixture bait and the other trap contained a seed only bait. Two objectives were examined: to determine differences in small mammal capture rates in prairie plots exposed to dormant season burns and prairie plots exposed to growing season burns as well as to determine the bait preference of small mammals. A two-sample t-test showed no difference in capture rates of dormant season and growing season burns. Another two-sample t-test also showed no difference in bait preference. This study is part of an ongoing research investigation, and when combined with future work may yield more significant results.

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Introduction:

Burning is a commonly used technique to maintain the proper growth of desired native prairie vegetation. This technique is used to control the growth of woody species, stimulate grass flowering, and aid in the cycling of nutrients (Madson and Oberle 1993). Burning prevents the overpopulation of invasive weeds or ground coverings and woody plants that would take over the area and leave little to no nutrients for the prairie grasses. Dormant season burning takes place in the fall and early spring, allowing for a thicker growth of vegetation than the growing season burning, which is performed in the late summer. Though, the growing season burns are more effective at eliminating woody growth (Gashwiler 1970). Different timings of the burns will change the landscape and type of plant growth, which will then affect the animals present; specifically, the mammalian fauna (Ford et. al 1991).

It was seen in multiple studies that the dormant season burns exhibited a more diverse population of small mammals (Beck and Vogi 1972, Francl and Small 2013). More vegetation present allowed for more niches within close proximities to be created. A more diverse variety of space can give more diverse niches to animals. The growing season burns, though, tended to have less vegetation present than the dormant season burns, which took away potential hiding coverage, and thus, a more specific tactic was needed by the local mammalian fauna to survive (Gashwiler 1970).

Some studies have shown that after the burning treatments, there was a difference seen in what species were present, but the total abundance of small mammals was not changed (Ahlgren 1966; Converse 2006). Some small mammals

seek more plant coverage in their habitat in order to avoid predators. These species can include southern short-tailed shrews (*Blarina brevicauda*), field mice (*Mus musculus*), and voles (*Microtus pennsylvanicus*), as well as others. Once an area has been burned, some of this potential coverage will be removed, and it will be harder for these species to survive (Converse et al. 2006). These burns can be healthy for the environment, though, and allow for better conditions for plants to grow and create a greater food supply. Some small mammals that do not need quite as specific niches will take advantage of this prosperous growth (Ahlgren 1966).

Small mammals can be representatives of the ecology of the land, and they can also be indicative of how well the management techniques, such as burning, are working. Live traps such as Sherman traps are commonly used to capture rodents for researchers to be able to collect data and then release the specimens. Baits must be used that will ensure to draw the animal to the trap. Scent and taste are key components of enticing the animals. Thus, odorous peanut butter traps have shown significant success over traps with no bait or traps with other food items like potted meat (Kumar et. al 2013, Hice and Velazco 2013).

Objectives:

The purpose of this study was to determine the difference in small mammal capture rates of in plots where dormant season burns were performed versus plots where growing season burns were performed. Another objective of the study was to determine if peanut butter is a more successful bait item than sunflower seeds.

Expected Results:

I expected to see more small mammals in the plots that have been burned in the dormant season because there will be more concealment. Finding more small mammals in plots subjected to dormant season burns would be consistent with previous studies performed at Cooper Farm.. The denser vegetation present in these plots will provide more shelter as an escape from predators and a place to establish their individual niche. The plots burned during the growing season do not have as thick of vegetation to provide these useful hiding areas.

I expect the peanut butter to be a more successful bait because it has a stronger odor than the sunflower seeds. This will also be consistent with other studies. These results will contribute to decisions about maintenance of Cooper farms, specifically in the scheduling of burning sessions. Bait data can also help determine what bait is best to use for the most successful capture rates in the future.

Methods:

Dormant Season vs. Growing Season Trapping Method

At Ball State University's Cooper Farms, 57 acres of prairie land was divided into 14 plots, each approximately 100 meters by 100 meters. In 2011 each plot was assigned to either growing season or dormant season burning management on a two-year rotation. Small mammal trapping sessions began September 28th, and there were a total of 11 sessions. In each session, 2 different plots were randomly chosen from the 14 plots. Within each plot, students placed 50 Sherman traps in a grid of 7 traps by 7 traps (7 north-south columns and 7 east-west rows), with 2

traps at the center. The traps were placed 10 meters apart from each other, and they were baited with a handful of sunflower seeds as well as bedding made up of a polyester fiber. In each session, the traps were placed on the first afternoon, checked the next morning, and checked the second consecutive morning during which they were also picked up. When the students checked the traps, they recorded the sex and the species of the small mammal, marked the fur on the dorsal side with a permanent marker in order to be able to recognize recaptures in the future, and then released the animal.

Bait Preference Trapping Method

In addition to the grids, students also set up a third trapping location on the same afternoon. A transect of 12 pairs of Sherman traps were strategically placed in this third area. One of the two traps was baited with a peanut butter and oatmeal combination, while the other was baited with only sunflower seeds. Each trap also contained the polyester fiber bedding. The pair of traps were placed side by side and oriented in the same direction. The next pair of traps were 10 meters from the previous pair in the transect line and were strategically placed in an area that had plant coverage and would be suitable habitat for rodents. This third plot was checked within the same schedule and data was collected in the same way as in the two grids.

Data Analysis

First, the capture rates in the plots subjected to dormant season or growing season burns were compared using a two-sample t-test to determine if there was a difference in the small mammals captures between plots with these two types of

prescribed burning. The capture rates of all individuals collected, regardless of species, were compared for the two types of burning. Then, a comparison was made for each species individually. The capture rates were also compared between the traps containing peanut butter and oatmeal combination and the traps containing seeds only using two-sample t-tests.

Results

There were a total of 73 individual small mammals trapped in the plots with the grid patterns. The most species trapped the most was *Blarina brevicauda* (Table 1). There were a total of 13 individual small mammals trapped in the transect. *B. brevicauda* was the most commonly caught species in the transects as well.

	Blarina brevicauda	*Peromyscus spp.*	*Microtus spp.*	*Zapus hudsonius*	*Neovison vison*	All Species
Growing Season	22	5	8	2	1	38
Dormant Season	15	11	8	1	0	35
Total	37	16	16	3	1	73

Table 1: Captures organized by the species of the individual and the type of prescribed burning used on the plot the individual was found in.

The mean capture rate for *B. brevicauda* in dormant season burns was 1.89 ± 0.40 captures per plot. The mean capture rate of *B. brevicauda* in growing season burns was 2.86 ± 0.35 captures per plot. The data suggests that there are more *B. brevicauda* present in plots that were subjected to dormant season burns, but more data are need to verify this ($p=0.096$). The mean capture rate for *Peromyscus spp.* in dormant burns was 2.33 ± 0.88 captures per plot. The mean capture rate of *Peromyscus spp.* in growing season burns was 2.25 ± 0.75 captures per plot. There was no significant difference seen

in the capture rates between dormant season and growing season plots (p=0.946). The mean capture rate for *Microtus spp.* in dormant season burns was 1.6 ± 0.24 captures per plot. The mean capture rate for *Microtus spp.* in growing season burns was 2.67 ± 0.67 captures per plot. There was no significant difference seen in the capture rates of *Microcutus spp.* between dormant and growing season burns. The mean total capture rate for all species together for dormant season burns was 3.67 ±0.75 total captures per plot. The mean total capture rate for growing season burns was 4.89 ± 0.70 total captures per plot (Figure 1). There was no significant difference between the total capture rates of dormant season and growing season burns (p=0.249).

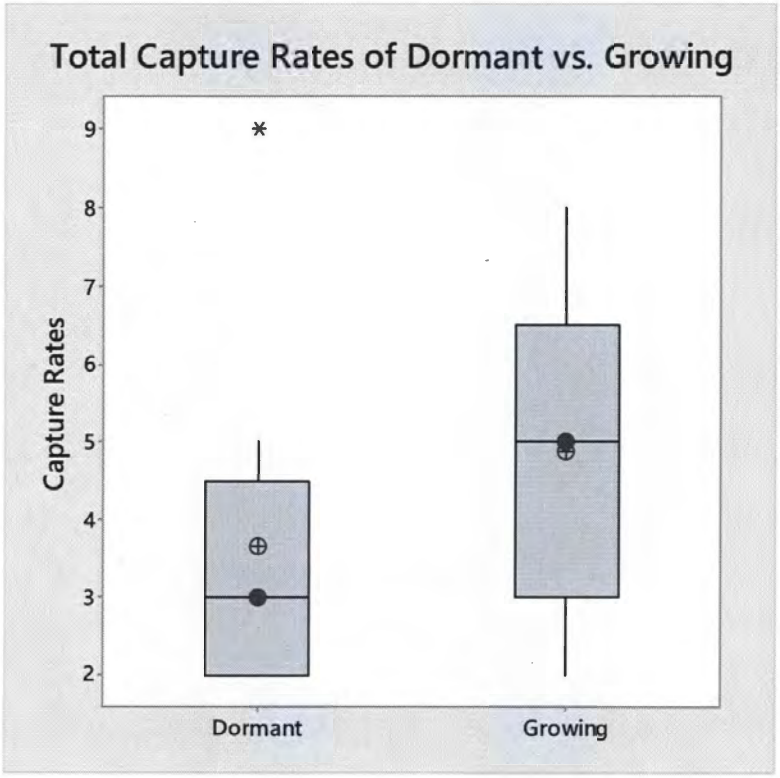

Figure 1: Small mammal capture rates in dormant season versus growing season burn plots.

The mean capture rate of traps with the peanut butter and oatmeal combination bait was 1.80 ± 0.58. The mean capture rate of traps with the seed bait was 2.00 ± 1.0. There was no significant difference between the capture rates of the peanut butter and oatmeal combination baited traps and the seed baited traps (p=0.891; Figure 2).

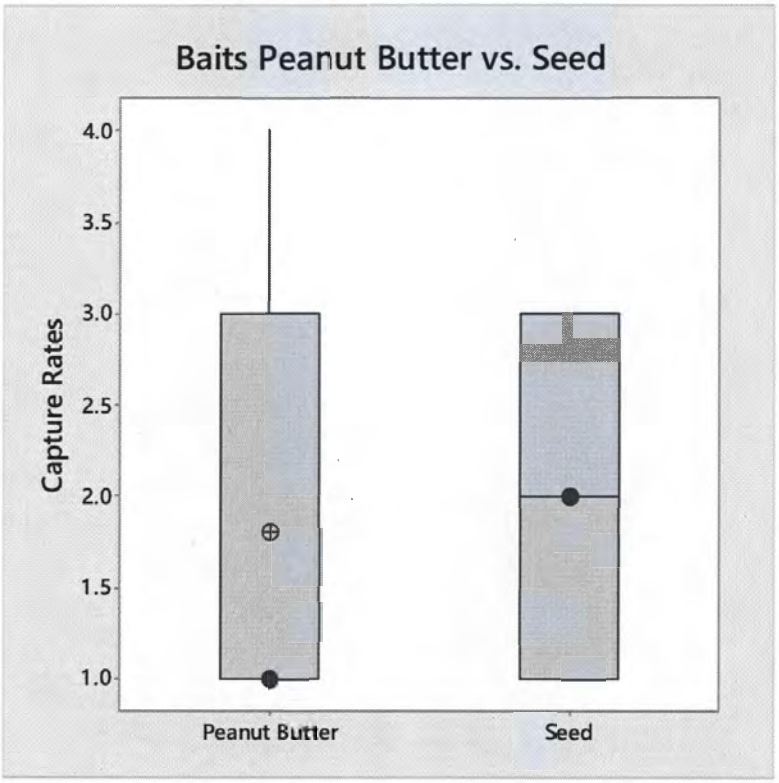

Figure 2: The capture rates of traps baited with a peanut butter and oatmeal combination vs. traps baited with only seeds.

Discussion

Effects of dormant season vs. growing season burns on capture rates

The hypothesis was not supported by the results. Data analysis revealed that the burn type does not have an effect on the amount of small mammals present. This contradicts the results of a study performed on Cooper Farm in 2013 where more

small mammals were present in the plots subjected to dormant season burns than plots subjected to growing season burns (Bailey 2014). However, the results from this study match a different study performed on Cooper Farm in 2014 (Straiker 2015). There was one species, *B. brevicauda*, that the results appeared to show a trend where there were more of this species present in the plots subjected to dormant season burns, but more data is needed to confirm this. Voles tend to seek habitat where there is plenty of plant coverage to use for hiding from predators (Towne and Craine 2014). This reasoning would match this trend. There were no other differences seen between dormant season burns and growing season burns among the specific species.

Capture rates of peanut butter and oatmeal bait vs. seed bait

The results do not support the hypothesis that small mammals prefer a peanut butter and oatmeal combination to seed bait. If there had been a bigger sample size, there is chance that different results could have been seen. A previous study done at Cooper Farm in 2014 yielded results that suggested that small mammals preferred the peanut butter and oatmeal combination mixture to the seed bait, but it was not a significant result and more data was needed for confirmation (Argabright 2014).

Future Implications

The type of burning that is used on the land at Cooper Farm may not be important, but burning should still be performed. Prescribed burning allows seeds to be spread throughout the fields and reduces woody plant material that can impede the growth of the other green vegetation. This renewal of resources allows

for the local fauna to access more food and have better shelter. As part of an ongoing study, there may be more results yielded by future work that can help provide a clearer picture of what works best on Cooper Farm.

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